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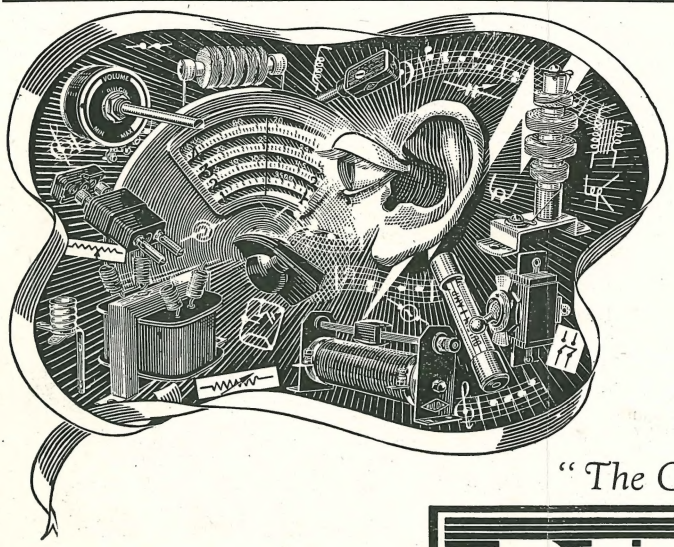

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BRITISH AND AMERICAN LICENCES COMPARED

IT is still much too early to forecast the conditions which will govern the re-issue of experimental radio licences after the war, but the present time seems appropriate to refer briefly to some of the differences which existed in pre-war days between amateur radio as practiced in Great Britain and the United States of America.

Judging by the number of enquiries which are received at Headquarters very few new members possess more than a hazy knowledge of how licences were obtained before the war. Fewer still seem to know that each Government possesses the right to define the conditions which will apply when issuing amateur experimental licences.

British amateurs are licenced by the Postmaster-General to conduct *experiments* and they are not permitted to send or receive third party messages which would infringe the Post Office monopoly of communications. In the U.S.A. control is vested in the Federal Communications Commission, a Government Authority whose primary function is to see that amateurs conform to certain International and National regulations.

American amateurs are permitted, nay encouraged, to handle third-party traffic, with the result that interest in this aspect of amateur radio ranks high with our friends across the Atlantic. The remarkable achievements of American amateurs in times of national calamity (floods, hurricanes and the like) have earned for them high praise from the leaders of American public life. It has also done much to present American amateur radio in a favourable light to the general public. It is extremely doubtful, however, bearing in mind the small area of the United Kingdom, whether British amateurs would, at any time, show a great interest in local traffic handling, although the opinion has frequently been expressed that if non-commercial message handling were permitted, it would do much to improve the standard of operating.

The question of power has been for many years a topic for discussion whenever British and American amateurs meet. Recent correspondence published in *QST* shows that even in America many are of the opinion that the pre-war maximum power of one kilowatt permitted to United States amateurs, was too high, but it is not our business to discuss the pros and cons of that particular problem. Accustomed as we are to think in terms of 10, 25 or perhaps 50 watt licences, it is not easy for many readers to visualise the type of power pack required to produce, say, 500 milliamperes at 2,000 volts. Certain it is that the average pre-war British experimenter could not have afforded the equipment needed to produce an input to the final amplifier of 1,000 watts even if he had possessed the necessary permission.

Since 1919, the British amateur has been required to pay, in hard cash, for the right to operate an experimental station. In addition he has been charged a small fee for his Morse Test unless he has been able to produce evidence of his proficiency in that respect. In pre-war days British amateurs who were licenced to use 10 watts paid £1 per year. Those authorised to use 25 watts or higher power, paid higher fees. In America no fees of any kind were demanded, yet there were approximately 40,000 licencees in that country compared with 2,500 in the United Kingdom.

Once granted, a British amateur retains his licence for all time, provided (*a*) he behaves himself, (*b*) he pays his annual licence fee, and (*c*) he "misses" a war! In America an application must be made periodically for the renewal of every licence. A British licence is issued to an individual, and the holder alone is allowed to operate the station covered by the terms of the licence, unless he has special permission to employ a second operator. In the States two licences are issued, one, the operator's licence, which permits him to operate any licenced U.S. amateur station and the other, a station licence, which permits the owner to instal and operate his own station under a Government issued call-sign.

Whereas British amateurs are required only to satisfy the G.P.O. that a radiating licence is necessary for their experiments, American amateurs must pass a technical examination.

No restrictions are placed upon the experimental activities of British amateurs, telegraphy and telephony being permitted on all licenced bands. American amateurs, on the other hand, are required to pass quite stiff examinations prior to permission being granted to use telephony and the v.h.f. bands.

British amateurs do not enjoy the use of the full international frequency allocations; certain small "guard" bands, a few kilocycles wide, being kept free in order to prevent any "edge of the band" transmission interfering with neighbouring services. American amateurs may use the full width of the internationally allocated bands.

Such are some of the chief differences which exist between amateur radio in Great Britain and the United States. Whether they will continue after the war, no one can say. We should, however, be interested to read the views of members on any matter concerning licences, but as paper is scarce please be brief. Finally, it is of little use at the present juncture putting forward bright ideas for obtaining wider frequency bands!!

J.C.

NEGATIVE FEEDBACK IN TRANSMITTERS AND RECEIVERS *

By H. A. M. Clark, B.Sc.(Eng.), A.M.I.E.E.

PART II—APPLICATIONS OF NEGATIVE FEEDBACK IN TRANSMITTERS AND RECEIVERS

HAVING reviewed the basic principles involved in the use of negative feedback, attention can now be given to the application of these principles to the design of receivers and transmitters.

The Use of Negative Feedback in Amplifier Circuits

Effective use can only be made of feedback circuits where amplification is available. The ways in which feedback can be introduced into amplifier circuits will therefore be considered first in a general way. Any of these circuits can then be applied to the various forms of amplifiers which go to the make up of transmitters and receivers, provided due attention is paid to the frequencies at which such amplifiers operate.

Current Feedback

The introduction of negative feedback into single stage amplifiers or into a single stage of multistage amplifiers will be discussed first.

One of the simplest forms of circuit is that shown in Fig. 3 (a). An independently heated triode is given a cathode resistance in the manner usually adopted for providing grid bias, except that the condenser which is normally connected from cathode to earth is omitted. This resistance R_1 can be considered as being in series with the anode load R_3, although the anode supply appears between them. The anode load current therefore flows through it. R_1 corresponds, therefore to the resistance r_0 in Fig. 2 (b). (See Part I.) The A.C. component of the anode current produces across R_1 a voltage drop of V_f which is the feedback voltage and is in series with V_i across the grid and cathode of the valve.

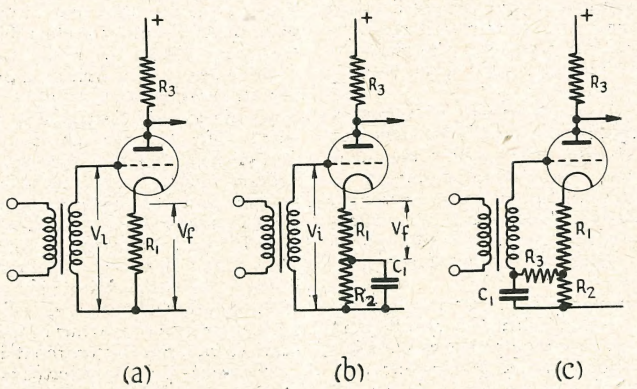


Fig. 3.

Three circuits using Current feedback : (a) Introduction of Current feedback by means of bias resistance (R_1) ; (b) Feedback resistance less than bias resistance ; (c) Feedback resistance greater than bias resistance.

If the input voltage, V_i is such as to drive the grid in a positive direction, the anode current will increase and so drive the cathode positive. The grid cathode voltage is thus reduced by the voltage V_f, *i.e.* the feedback is negative.

In this circuit the value of β as given by equation (9) is equal to $\frac{R1}{R3}$.

It should be observed that the symbol μ as used in Part I, referred to the overall effective voltage amplification of the portion of the amplifier over which feedback is applied, and should not be confused with the amplification factor of the valve itself. If the triode in Fig. 3 (a) has an amplification factor equal to μ_o and an anode impedance of R_a, then

$$\mu = \mu_o \frac{R_3}{R_a + R_3}$$

This is the correct value of μ to use in all the expressions in Part I when evaluating the change in gain, distortion, and impedances.

Exactly the same circuit can be applied to pentodes and beam tetrodes. In such cases the value of the stage amplification can be taken as

$$\mu = gR_3,$$

where g = mutual conductance in amperes per volt.

As already shown in Part I, the use of current feedback will increase the effective anode impedance of the valve. This increased anode impedance must be taken into account in any considerations of matching the valve which may arise when the feedback is used.

The use of an unbypassed bias resistance as in Fig. 3 (a) limits the value of R_1, and hence the amount of feedback in use, to that required for correct biasing. If less feedback than this is required, part of the cathode resistance can be bypassed by a condenser as in Fig. 3 (b). Here, the condenser C_1 short circuits the A.C. voltages across R_2 and hence the feedback resistance, consists of R_1 only although the bias resistance comprises $R_1 + R_2$.

It may be that more feedback is required than is provided in Fig. 3 (a). To do this the circuit in Fig. 3 (c) can be used. In this arrangement the total cathode circuit resistance of R_1 and R_2 is the feedback resistance, while the grid bias is tapped off R_1 only (which should be made equal to the normal bias resistance) through a resistance R_3 which is made high compared with R_2. The condenser C_1 is proportioned so that its reactance at the lowest frequency of interest is much larger than R_3. This effectively connects the lower end of the input transformer to the bottom of R_2 for the A.C. signal frequencies. In this way the A.C. voltage introduced into the grid circuit is that developed across $R_1 + R_2$ while the D.C. voltage applied to the grid is that dropped across R_1 only.

Such circuits can be used when the grid is driven from a resistance or choke coupled circuit equally well as from the transformer coupled circuit shown in Fig. 3.

* *A paper read to the membership at a meeting of the Society held on April 29th, 1944, at the Institution of Electrical Engineers, London. (Part I appeared in the July 1944 issue.)*

Voltage Feedback

Fig. 4 (a) is an example of voltage feedback applied to a single stage. Although a triode is shown for simplicity, a tetrode or pentode can equally well be used. This time the valve is given a normal cathode resistance for biasing purposes, but it is shunted by a large condenser C_1 so that there is no A.C. feedback voltage across it. Across the anode circuit is connected a pair of resistances R_1 and R_3 which correspond to r_1 and r_2 in the block diagram of Fig. 2 (a). The condenser C_2 is a blocking condenser to prevent the anode voltage from influencing the grid bias. It should be made large enough for its reactance to be very small compared with $R_1 + R_2$ at the lowest frequency of interest. The feedback voltage appears across R_1 and the value of β is given by,

$$\beta = \frac{R_1}{R_1 + R_2} \text{ from equation (8)}$$

When a voltage feedback circuit of this type is used the anode impedance of the valve will be reduced as calculated in Part I. This fact can frequently be made of value when amplifiers of very low output impedance are required.

The circuit of Fig. 4 (b) also uses voltage feedback on the second valve, but this can be considered as an example of parallel feedback. The feedback voltage appears across the same resistance as the input voltage, *i.e.* R_1 due to the presence of the resistance R_2 between anode and grid. A blocking condenser is connected in series with R_2 in order not to interfere with grid bias produced by the cathode resistance.

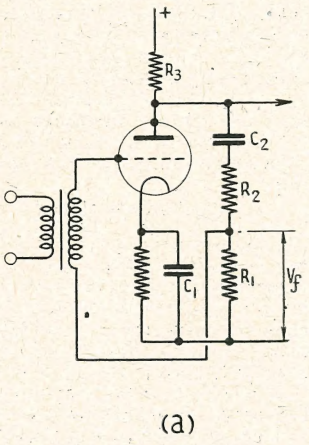


Fig. 4.
Two forms of Voltage feedback : (*a*) Series ; (*c*) Parallel.

The value of the feedback ratio β is not so obvious in this circuit, but it can be obtained by considering equation (8) carefully. The value of r_2 is clearly given by R_2 in Fig. 4 (b) but the value of r_1 must be taken as R_1 in parallel with R_3 and the anode resistance of the first stage valve (R_a).

$$i.e. \frac{1}{r_1} = \frac{1}{R_1} + \frac{1}{R_3} + \frac{1}{R_a}$$

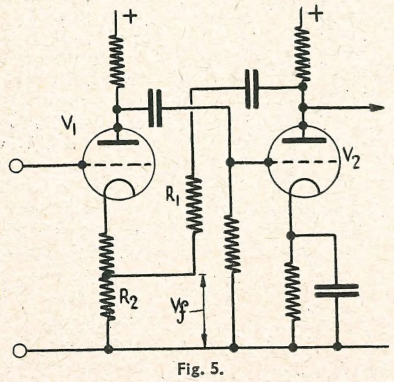


Fig. 5.
Voltage feedback over two stages.

Feedback through more than one Stage

In all the preceding circuits the feedback has been applied to the grid circuit of the same valve as that from whose anode circuit it is derived. The value of μ is therefore limited to the effective amplification of a single stage. If a greater amount of feedback is desired two or more stages can be included in the feedback chain.

Fig. 5 shows one possible arrangement with two stages. When only one stage is used, negative feedback is obtained by feeding back from the anode to the grid, the 180° phase-shift in the valve thus satisfying the required conditions referred to in Part I.

When two, or any other *even* number of, valves are used feedback from the anode of the second valve to the grid of the first would result in positive feedback. The well-known Franklin oscillator is an example of such a circuit. To obtain negative feedback over two stages, the feedback voltage is introduced into the cathode circuit of the previous valve as shown in Fig. 5. The feedback ratio is given by $\frac{R_1}{R_2 + R_1}$. As drawn, there is some additional feedback in the first valve also, due to the unbypassed cathode resistance which acts as in Fig. 3.

Fig. 6 illustrates a circuit with feedback applied over three stages. The feedback voltage is derived from the anode circuit of the third valve by means of an arrangement similar to that shown in Fig. 2 (c) of Part I, in order to provide the required feedback voltage and yet control the output impedance within the required limits. (9) Since the number of stages is odd the feedback voltage can be applied to the grid of the first valve in series with the input voltage from the input transformer secondary.

The advantage of this particular arrangement may be referred to here. In much communication equip-

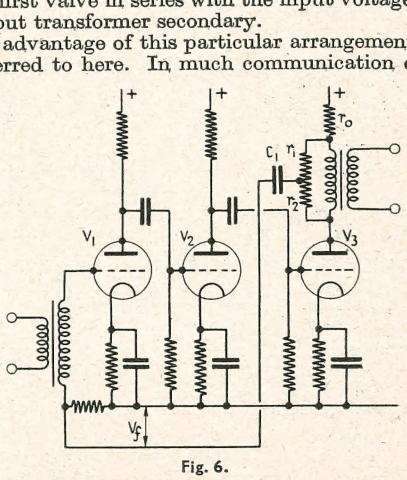


Fig. 6.
Combined Voltage and Current feedback applied to three-valve amplifier. The Current feedback voltage developed across r_o is added to that taken from the tapping between r_1 and r_2.

ment it is desirable to operate the output stage of an amplifier into a matched load. This may particularly be the case when the output feeds a long line. But very few valves will give their maximum output power into a matched load. Most triodes have an optimum load of from twice to thrice the anode impedance, whilst the optimum load for a pentode is usually only a small fraction of the anode impedance. With the circuit of Fig. 6 the load impedance can be made to equal the optimum value called for by the valve, by a suitable choice of ratio in the output transformer and so allow the output valve to work under the best conditions for maximum undistorted output power. The output impedance of the valve can then be modified by the choice of r_o, r_1, and r_a until it equals this optimum load. The output circuit will then be matched. The correct values of these components can be calculated from the formulæ already given in equations (*13*) and (*14*) of Part I.

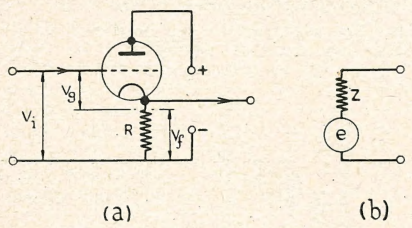


Fig. 7.

The Cathode Follower. The whole of the output voltage in the cathode circuit operates in the input circuit as a feedback voltage (V_f).

Cathode Coupled Circuits and the Cathode Follower (*10*) (*11*) (*12*)

Fig. 7 (a) shows the basic circuit of a triode arranged as a cathode follower. The operation of this circuit has been fully dealt with elsewhere, but it is included here as an example of a single stage amplifier in which the whole of the output voltage (which in this case is taken from the cathode) is fed back to the grid circuit. In equation (*4*) β can therefore be given the value of unity, in which case

$$\frac{V_o}{V_i} = \frac{V_f}{V_i} = \frac{\mu}{1+\mu}$$

The effective amplification is therefore slightly less than 1 but can be considered as equal to unity if μ is much greater than 1, as is usually the case.

Putting $\beta = 1$ in equation (*11*) gives the output impedance.

$$R'_o = \frac{R_o}{1+\mu}$$

In this case R_o = the valve anode impedance R_a

∴ Output impedance

$$= \frac{R_a}{1+\mu}$$

The equivalent circuit to the cathode follower is as in Fig. 7 (b) where,

$$e = V_i \frac{\mu}{1+\mu}$$

$$Z = \frac{R_a}{1+\mu}$$

If $\mu >> 1$ it may be said that

$$e = V_i \text{ approximately.}$$

$$\text{and } Z = \frac{R_a}{\mu} \text{ approximately.}$$

$$= \frac{1}{g} \text{ approximately.}$$

where g is the mutual conductance of the valve in amps./volt.

The cathode follower has many uses. Its main function is to enable a high impedance source of driving voltage to be coupled to a load which demands current without causing a loss of driving voltage. One example is where an amplifier is required to drive a Class B output stage into grid current. By using a cathode follower, or "cathode driver," between the output stage and the penultimate amplifying stage, the grid current can safely be supplied from the cathode circuit without the distortion of the voltage wave which would result if the drive were taken direct from the voltage amplifying stage.

Since valves are now obtainable with a mutual conductance of say 10 mA/volt they have a cathode impedance of

$$\frac{1}{g} = \frac{1}{\cdot 01} = 100 \text{ ohms.}$$

This means that they can be used to drive a co-axial line of similar characteristic impedance and conveniently terminate it at the same time. For low frequency work a transformer could of course be used, but for radio frequencies where a wide band has to be covered, as in television circuits, the cathode follower forms a very convenient output stage.

If the load on the cathode follower is not suitable for carrying the D.C. cathode current of the valve the resistance R of Fig. 7 (a) is inserted. In order not to load the cathode circuit, its value should be considerably greater than the cathode impedance of the valve ($1/g$). It may sometimes produce too much grid bias on the simple circuit shown, in which case a grid condenser and leak can be used with the lower end of the leak tapped down R to a point of suitable biasing potential.

Phases Splitting Stages in Push-Pull Amplifiers

Although an intervalve transformer with two secondary windings has been a very popular means of coupling an unbalanced or "single-ended" stage to a balanced or "push-pull" stage, there has been a trend in recent years to use purely electronic arrangements. Such circuits have the advantage of being able to operate more readily over a wider band of frequencies than can be covered by an easily made transformer. The now well-known paraphase circuit was probably the first of these circuits but more recently feed-

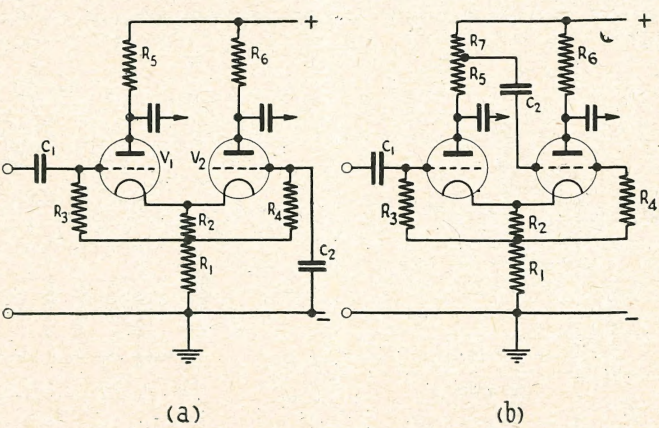


Fig. 8.

Two forms of Phase-splitting amplifier. Push-pull voltages are produced at the two anodes for a voltage applied to one of the grids only.

back methods have been applied to improve the performance of this part of the amplifier.

A method of phase-splitting which is a descendent from the cathode follower is shown in Fig. 8 (a). ([22]) The two valves V_1 and V_2 have their cathodes joined to a common cathode resistance which is made very large compared with the cathode impedance ($1/g$) of the valves. The cathode resistance consists of R_1 and R_2 in series, so that a convenient potential can be tapped off at this junction for grid bias through the grid leaks R_3 and R_4. Two similar resistance R_5 and R_6 are connected to the anodes from which a push-pull output is to be obtained. Since the circuit is completely symmetrical, both valves will draw the same anode current. The "single-ended" input has its "live" side connected to the grid of V_1 through the condenser C_1, the grid of V_2 being connected to earth *via* the condenser C_2. Reverting to the cathode follower of Fig. 7 it might be thought that V_1 would behave exactly similarly with its cathode having the same signal on it as its grid. The cathode of V_1 is, however, loaded not only by R_1 and R_2 which are very high compared with the cathode impedance, but also by the cathode impedance of V_2. Assuming that both valves are similar, the cathodes will acquire a signal voltage equal to one-half of that applied to the grid of V_1, since the cathode impedance load of V_2 is the same as the internal cathode impedance of the driving valve V_1.

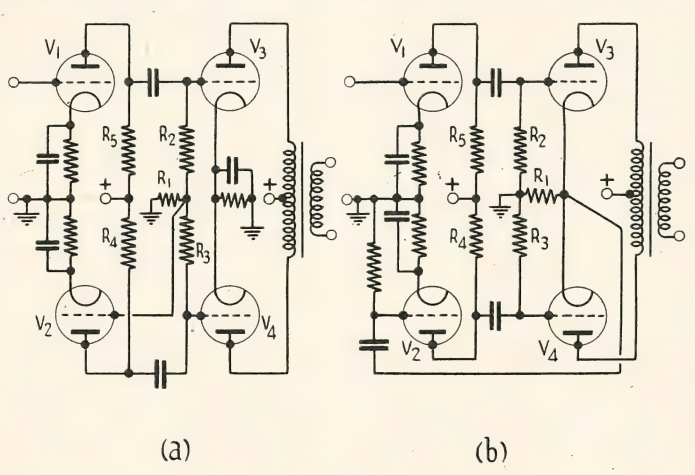


Fig. 9.

Two Phase-splitting circuits in which balance is maintained by feeding back the unbalance voltage on to the grid of V_2. In (*a*) the unbalance of the anode swings of V_1 and V_2 is taken from the junction of R_2 and R_3. In (*b*) the unbalance of cathode currents of V_3 and V_4 is taken from the common cathode resistance R_1.

Now considering the A.C. signal voltages only, if a voltage of $+V$ is applied to the grid of V_1, both the cathodes will be at $+V/2$ and the grid of V_2 is earthed. Thus, relative to the cathodes, the grid of V_1 is at $+V/2$ while the grid of V_2 is at $-V/2$. In other words a balanced or push-pull input has been produced which will produce a push-pull output on the anodes. As shown in Fig. 8 (a) this output would be taken to a push-pull output stage, but, if desired, a push-pull output transformer could be used to supply the load direct from the anode of V_1 and V_2.

It will be found in practice that the outputs of V_1 and V_2 will not be exactly balanced since the cathode resistance $R_1 + R_2$ will shunt the cathode impedance of V_2 slightly. For this reason the anode resistance R_6 can be made slightly higher than R_5 to give an exactly balanced output. The greater $R_1 + R_2$ is made, the greater the degree of balance between the two valves, but a limit is reached in that with a given source of anode voltage, the greater the cathode resistance the higher will be the D.C. potential of the cathodes and the less will be the available anode cathode voltage.

Fig. 8 (b) shows a phase-splitting stage in which the grid of the second valve is driven from a tap on the anode resistance of the first, as in the paraphase circuit. The cathodes are, however, connected to a common cathode resistance as in Fig. 8 (a). This will tend to force the anodes into balance and the usual pre-set potentiometer to control the drive to the second valve in the paraphase arrangement, can therefore be dispensed with.

Two other arrangements using a form of negative feedback are shown in Fig. 9. In Fig. 9 (a) V_1 and V_2 form a phase-splitting stage driving a push-pull output stage V_3, V_4. The grid of V_1 is driven from the input, while the grid of V_2 is connected to the centre-tap between the two grid leaks R_2 and R_3 of V_3 and V_4. The grids of V_2, V_3, and V_4 are connected to earth *via* R_1 and each valve has the orthodox by-passed cathode resistance biasing arrangement, V_3 and V_4 being provided with a common resistance to assist in balancing the D.C. anode currents in the output stage.

The only input to the grid of V_2 is a feedback voltage from the junction of R_2 and R_3. This will tend to adjust itself until the anode swings of V_1 and V_2 are balanced. The greater the amplification of V_1 and V_2 the nearer balance will the circuit become.

A similar circuit is given in Fig. 9 (b) except that the cathodes of V_3 and V_4 are connected to a common cathode resistance R_1 which is not by-passed, as in Fig. 8. The grid of V_3 is driven from the cathode voltage of V_3 and V_4. Thus the unbalance of cathode voltage is kept to a minimum by means of the feedback voltage to V_2.

Tone Control by means of Negative Feedback

Although negative feedback has been used chiefly to reduce amplifier distortion, it is sometimes used to introduce the deliberate form of frequency distortion generally referred to as "tone control."

This is achieved by putting a frequency characteristic in the feedback path of the opposite type to that required in the amplifier. For example if a bass loss is required, negative feedback is introduced, which

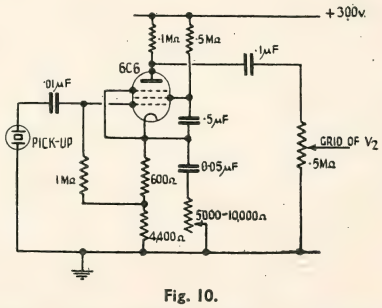


Fig. 10.

Tone control by means of negative feedback. The impedance of the cathode circuit falls at high frequencies, thus reducing the feedback and increasing the gain. The magnitude of the effect is controllable by means of the variable resistance.

increases at low frequencies. Fig. 10, which is reproduced from an article by C. Coates in the R.S.G.B. BULLETIN for October, 1942, ([13]) illustrates an amplifier for a piezo-electric pick-up. The response characteristic of the pick-up was known to fall at the higher frequencies, and the design of the amplifier is therefore such as to introduce more feedback at low than at high frequencies. The feedback impedance is connected in the cathode circuit as in Fig. 3 (c) and consists of a fixed 5,000 ohms resistance shunted by a condenser of ·05 μF in series with a resistance variable from 5,000 to 10,000 ohms.

The amplifier characteristic is required to rise at 8,000 c/s by about 10 db in order to compensate for the fall in pick-up sensitivity. By adjustment of the variable resistance the use of the high frequency gain can be made greater or less than this amount, so that the overall characteristic of pick-up and amplifier together may be made to rise or fall at will by an amount suitable for tone control purposes.

Similar circuits can be devised for bass boosting by the use of an inductance in parallel with a resistance in the cathode. This causes the impedance of the feedback circuit to fall at low frequencies, reducing the feed-back and causing the amplifier gain to rise.

Volume Expansion

Volume expansion, as a means of compensating for the compression which is generally necessary for transmission by radio or for recording, has been accomplished by numerous methods, many of which tend to introduce distortion. Fig. 11 shows a circuit in which variable negative feedback is automatically controlled in accordance with the signal strength, so that the feedback is reduced as the signal increases, thus increasing the gain with increasing signal. The method, which is due to B. J. Stevens of the South African Broadcasting Corporation, ([14]) is claimed to introduce less distortion than the more orthodox type of circuit which uses variable-mu valves to control the gain of the amplifier. Referring to the figure, the input terminals are seen to be connected to the primaries of two transformers. That on the left feeds the grid circuit of a control amplifier of conventional type which drives a rectifier, the output of which is taken through a potentiometer labelled "Contrast Control," and smoothed by means of a resistance-capacity filter circuit. The output of this is a D.C. potential which becomes increasingly negative in proportion to the signal. It is connected in series with a biasing potential of 4 volts which determines the starting voltage of the rectifier output.

The transformer to the right of the input terminals feeds the main amplifier which consists of a triode with negative feedback applied to it of the type illustrated in Fig. 4 (a). Whereas in Fig. 4 (a) the feedback circuit consists of R_2 and R_1 in series, with the feedback voltage taken across R_1, in Fig. 11 the VP4B pentode is substituted for R_1 and the feedback voltage is taken from the 250-ohm resistance which serves as R_2. It will be seen that the anode to cathode impedance of the pentode is used as R_1. The control grid and the suppressor grid of the pentode are connected in parallel and are controlled from the rectified D.C. output from the contract control potentiometer. As the signal rises, the two pentode grids are made more negative, which increases the anode impedance of the pentode. Thus the value of $R_1/R_1 + R_2$ is increased, so reducing the negative feedback to the main amplifier triode whose amplification is thus increased. The output from the system is taken across the 250 ohms resistance *via* an output transformer. By inverting the rectifier, volume compression can be obtained by the same circuit.

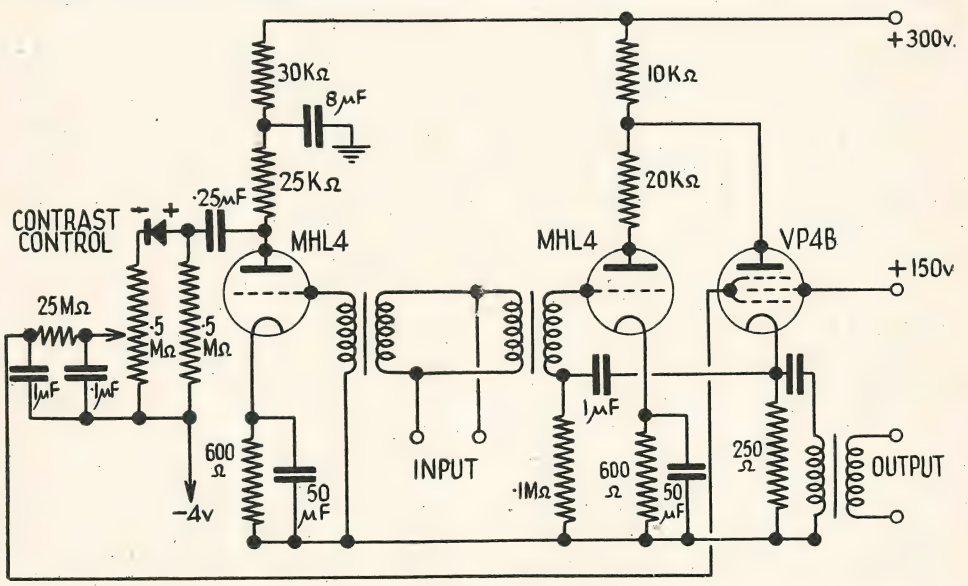


Fig. 11.

Volume expansion using negative feedback. The amount of feedback is controlled by the anode impedance of the pentode which is made to depend upon the strength of the input signal by having its grid potentials controlled from the rectified input signal.

(To be concluded)

OUR FRONT COVER

THE part that is being played in the war effort by "AVO" Electrical Testing Instruments is such that it can be truly said that they are actively engaged on the fighting and factory fronts. They are sharing a great responsibility with a proud sense of duty and high confidence in the future. It will be appreciated that, under present circumstances, orders can only be accepted which bear a Government Contract Number and Priority Rating. Enquiries should be addressed to The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, S.W.1. Telephone: Victoria 3404-8.

SERVICING COMMUNICATIONS RECEIVERS

By H. W. Miles (G2NK)

PART—II

The Alignment of Communications Receivers

IN aligning the tuned circuits of a superheterodyne receiver the first unit to receive attention must be the intermediate frequency amplifier. It is in this part of the set that the main selectivity and gain is achieved and the process of alignment must be carefully carried out if optimum results are to be obtained. It is advisable to leave the set switched on for about an hour before any adjustments are made so that any frequency drift, due to temperature changes, can be allowed for. In the simpler types of sets, such as the "Sky Buddy" or "Sky Champion," having one or two straight stages of I.F. amplification without crystal filter or variable selectivity, the procedure is simple. It is generally advisable to stop the H.F. oscillator from functioning either by removing the oscillator valve (if a separate one is fitted) or by shorting-out the oscillator section of the gang condenser, if a combined mixer-oscillator is used, or if the receiver is of the A.C./D.C. type, with series connected heaters. Switch out the A.V.C. circuit and feed a modulated signal of the correct frequency into the grid of the mixer valve, the return lead from the generator being connected to chassis.

The trimming can be carried out aurally or an output meter can be connected across the speaker terminals. In either case the smallest possible input should be used, as a slight change is more easily noticed. In this type of receiver the I.F. transformers are aligned "on the nose" and no attempt is made to trim above and below resonance to obtain a band-pass effect. This being so, start at the circuit nearest the second detector and carefully adjust each trimmer for maximum signal, reducing the generator output as trimming proceeds. The audio gain control can be set at any convenient point but it is generally advisable to use a high audio gain setting, keeping the signal down by reducing the generator output. Go over the trimmers a second time to make sure that each circuit is truly aligned and then switch off the modulation note and turn on the beat-frequency oscillator in the receiver. These controls usually have a small variable condenser for pitch control shunted by a preset trimmer. Set the pitch control halfway in and adjust the trimmer for zero beat frequency. You will then have a range of pitch frequency each side of zero beat.

Before passing on to the alignment of signal frequency circuits the alignment of an I.F. amplifier having a crystal filter will be considered. There are various methods of doing this, such as by removing the crystal and using it in a suitable oscillator circuit, or by leaving the crystal in circuit and adjusting the signal generator to the crystal frequency. If the receiver is fitted with a sensitive signal strength meter, such as is found on the RME-69, there is an even simpler method which will be described first. Tune in a local broadcast station, that can be relied upon to give a steady signal level, and with R.F. gain full on, A.V.C. on and crystal in series position, reduce the aerial coupling until the signal meter reads about half scale. In most cases only a few inches of aerial wire will be required. The main tuning should be set so that the band-spread dial reads about halfway at resonance. The I.F. trimmers can then be adjusted to the greatest meter reading, keeping the tuning in resonance by means of the band-spread dial. This latter will be exceedingly sharp with the crystal in circuit. Lower the R.F. gain if the meter tends to move off the scale. The beat frequency oscillator can be adjusted at the same time by heterodyning the broadcast signal. If a signal generator is used the crystal should be switched in as before and the modulated frequency adjusted until the signal peaks sharply. In some cases the note will become very rough and if this occurs the crystal can be switched out when the generator setting has been obtained, and the alignment carried out as before. As difficulty is sometimes experienced in getting a resonator crystal to oscillate in a separate circuit this method of alignment is not recommended for general use. In the case of receivers having variable selectivity, the control should be set at the sharpest position when aligning the I.F. amplifier.

Aligning the Signal Frequency Circuits

The high-frequency oscillator determines the frequency to which the set responds and therefore this circuit must be trimmed first. In normal superheterodyne practice the H.F. oscillator is tuned to a frequency above the signal, equal to the intermediate frequency. Thus if a particular waveband on a receiver tunes from 1,550 kc/s. to 4,300 kc/s. and the intermediate frequency is 465 kc/s. the H.F. oscillator must operate over a frequency band from 2,015 kc/s. to 4,765 kc/s. With normal shaped condenser vanes it becomes necessary to fit series-padder condensers in the tuned circuit in order that the oscillator will track correctly. When aligning, these padders are adjusted at the low frequency end of the band and the parallel trimmers at the high frequency end. In the aerial and R.F. circuits it is normal practice to fit only parallel trimmers, although in some of the higher priced receivers inductance trimming adjustments are included. The gang condenser itself is usually adjusted for equal capacity per section at all points of the dial, either by having built-in parallel trimmers, or by having one rotor vane in each section split into segments for bending. It is generally unnecessary to interfere with this setting.

As an example we will assume that we are aligning the medium wave broadcast band of a typical communications receiver. Set the wave-range switch and adjust the dial to read at a point a little below the highest frequency, say at 1,400 kc/s. Connect the signal generator to aerial and earth terminals and feed in a modulated signal of this frequency. Adjust the appropriate parallel trimmer on the oscillator section until maximum output is obtained, keeping the generator output as low as possible as in the case of the I.F. alignment. When this point is reached retune the generator to a point near the L.F. end of the band, say 600 kc/s., and retune the receiver. It is possible that the greatest output will occur at a point removed from the 600 kc/s. dial reading, but in this case instead of leaving the gang condenser set, it should be rocked backwards and forwards about this point while the series-padder is adjusted for maximum output. This may not coincide with the 600 kc/s. dial reading, in which case return the generator to 1,400 kc/s. and retrim the H.F. end and then back again to 600 kc/s. rocking the condenser and adjusting the padder for maximum response. It may be necessary to carry out this operation three or four times before a point is reached where correct alignment is obtained at each end of the band. Having reached this point, keep the generator output at

(*Continued on page* 32)

EDDYSTONE COMMUNICATIONS TYPE RECEIVERS

with special reference to the 358

By Rex Heatley* (G5OH)

BEFORE describing in some detail the design, construction and manufacturing features of certain *Eddystone* receivers, it may be of interest to mention how the title " 358 " was derived. Whenever a new piece of apparatus is under construction in a factory a specification is prepared—the specification number assigned for the instrument in question was 358, hence it became generally known by that number both in and out of the factory.

Preliminary Considerations

Good design, construction and performance will always receive full recognition from the users of a communications type receiver, but the many problems which have to be overcome during the early stages of its development seldom receive the consideration that is due to those chiefly responsible. Furthermore, to most users, the actual manufacturing processes involved, are " a closed book " with the result that the makers are regarded as only being responsible for the faults that may develop or as being located " at the end " of a telephone line for the sole purpose of giving advice upon how its performance may be improved to the *n*th degree !

Assuming that such points as frequency coverage, number of valves, etc., have been decided a great deal of experimental work now falls upon the Development Department who are required to build up and test numerous circuit combinations. The results of these tests must be carefully recorded and filed. Time expended in this " non-productive " work (which only shows up in the final design) is usually taken for granted by the " man in the street."

Only after many weeks have been spent in perfecting the circuit arrangements is the stage reached when experimental models or prototypes can be put in hand. Modifications may even then be required before the final design emerges.

Manufacturing Problems

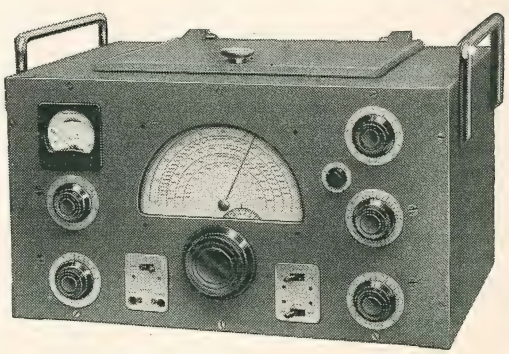
The next step is to ensure that the various parts which are to be made in the factory can be produced in sufficient quantities to meet the weekly demand that will be made by the assembly shops when they come into full operation. This may mean, as it often does, the re-distribution of certain plant, and the installation of additional equipment, especially for testing and checking purposes. An increase of plant at once indicates that additional labour will be required. If this is not skilled, arrangements must be made to provide for training so that when production gets into full swing, the entire works are running without a hitch, each person knowing his particular job and carrying it out to the high standard which is essential in order to make sure that the finished product is a precision instrument.

An examination of the 358 Receiver will at once show that much time and thought have been devoted to its construction in order to ensure that the mechanical design is as nearly perfect as possible, while the care that is taken with the electrical tests and alignment is emphasised by the general performance, reliability and accuracy of calibration.

The Purchasing Department will have to carry out a full investigation to see that the necessary parts and materials are available in sufficient quantity and quality to meet production requirements. This means that a great deal of correspondence will have to pass between the buyer and outside firms, and an accurate check made to see that if one manufacturer is unable to cope entirely with the demand for a particular component, an exactly similar item can be obtained from another in sufficient quantity to make good the deficiency.

Sometimes, owing to the design of a receiver, it is necessary for the outside suppliers to modify slightly their design to meet the requirements, and here again careful checks are necessary to see that the modifications called for are carried out to within the tolerances quoted on the drawings.

A system of progress chasing will have to be built up to ensure that deliveries are made to schedule, since any hold-up of material will be reflected in direct proportion as a hold-up of production.



The 358X Communications Receiver.

Now that these problems have been overcome, there remains only the work involved in getting production under way. As the receiver takes shape it gradually comes to the stage when a chassis test can be carried out, and after passing this it reaches the final test and alignment bench where it is very carefully adjusted to give maximum performance and accurate calibration. The dial calibration of the 358 for example is checked in steps of 10, 100 and 1,000 kc/s. throughout its entire tuning range. The staff carrying out this work are men with years of experience, many of whom regard radio as their hobby as well as their chosen occupation. A particular pride is taken in seeing that every set is as perfect as possible—in fact the sets are treated in the same way as they would be were they the personal property of the testers.

The 358 Receiver

The following is a description of the 358 Receiver which it is hoped will be of general interest.

The receiver is of the superheterodyne type, specially designed for consistent and reliable reception of telegraphy and telephony signals even under bad conditions. It requires an input of 6 volts at 1·4 amps, and 175/180 volts at 65 mA. high tension, which is supplied by a special power unit (S.390 or S.390B) when operating from A.C. mains.

* Late Technical Sales Manager, Stratton and Co. Ltd. Birmingham.

For operation from a 6 volts accumulator a special rotary transformer unit can be supplied to provide the necessary H.T. voltage. This unit is free from interference and allows the same degree of performance to be obtained as when the instrument is operated from the standard A.C. mains supply unit.

The receiver is now normally supplied with a band-pass crystal filter unit and is known as the type 358X. Triode output is available if desired, giving a reduced audio output which, however is more than adequate for all reception purposes.

The circuit arrangement is entirely straightforward. A variable Mu pentode H.F. amplifier stage followed by a triode-hexode mixer precedes two I.F. amplifier stages operating at 450 kc/s., a double diode triode supplies delayed A.V.C., and operates as second detector and first L.F. amplifier. The second L.F. amplifier stage, which forms the output employs either a triode or pentode, depending upon requirements. A fully screened and separate stage operates as beat-frequency oscillator for the reception of telegraphy signals. The first I.F. stage in the 358X incorporates the band-pass filter unit which may be brought into operation by means of the control switch mounted in the unit itself, but having the manual control knob located on the front panel of the receiver.

The full operating range of the instrument is from 31 Mc/s. to 40 kc/s., and is covered by ten coil units, four of which are calibrated on the tuning dial. The latter also has an outer 0–100 arbitrary scale for use with the remaining six units. The dial, which is illuminated and particularly free from glare, has been designed to eliminate as much as possible eye-strain over long periods of operation.

Tuning and Vernier Controls

The large centre knob, which is the tuning control, operates a three-gang condenser and causes a hair-line pointer to traverse the dial. The progression of the pointer across the dial can be controlled to give hardly perceptible movement, and the action of the whole component is extremely smooth and without backlash.

The tuning control system utilises a flywheel drive and spring-loaded Tufnol gearing, giving a ratio of approximately 70–1. The gearing, driven through a friction disc, is so arranged that when the pointer (which is attached to the shaft driving the gang condenser) is either at 0° or 100°, a small stop-pin prevents further movement of the shaft. The friction drive acts as a shock absorber, removing strain from the Tufnol gears themselves. The high ratio of gearing makes possible very accurate logging.

Mounted on the intermediate gear shaft, and flush with the main tuning dial, is the vernier logging scale; this is marked in 25 divisions. One complete revolution of the logging scale causes the main pointer to move 25° on the outer scale of the main tuning dial. Very accurate calibration can be obtained using two check readings taken against the small dial and the outer scale on the main dial, this check being exceedingly useful when using the receiver for spot frequency work. This vernier logging method supersedes earlier methods of electrical and mechanical bandspreading, with their associated disadvantages.

Other Controls

In addition to the main tuning control, there are H.F. gain, L.F. gain, beat frequency pitch, tone control, A.V.C., B.F.O. and H.T. on-off switches. In the case of the 358X there is also a selectivity switch. Two jacks are mounted on the front panel giving high and low resistance output for telephones or loud-speaker. The controls have their function clearly marked on the scales, and in the case of those with rotary movement, stops are built in to the actual knobs at the termination points to avoid strain on the shafts of the component.

There remains yet one more control to be described, namely, the check meter switch control. This connects a current meter across an appropriate shunt incorporated in each anode circuit. If a particular circuit is functioning correctly the meter needle will indicate within the limits of a black line marked "normal." Should the reading fall outside the limits of this line it is an indication that the circuit is not operating correctly and must be regarded with suspicion. In one position of the switch the meter is connected in the anode circuit of the 1st H.F. valve and in this position it acts as a tuning-dip indicator. This is particularly useful when tuning telephony stations with the A.V.C. circuit in operation.

Selectivity

Adjacent channel: 2 kc/s. at 2·5 db down. 5 kc/s. at 35 db down.

With crystal: 150 c.p.s. at 40 db.

Sensitivity

Approximately 3 μV above 1,500 kc/s. 8μV for lower frequencies.

Thirty per cent modulation for 50 mW. output on all ranges.

Image Ratios

At 20 Mc/s. 33/1; 12 Mc/s. 100/1; 9 Mc/s. 210/1; 4·5 Mc/s. 400/1; 3 Mc/s. 500/1.

Intermediate Frequency (450 kc/s.)

The L.F. transformers have received particular care in design and are highly efficient. They are free from drift due to climatic changes and maintain their set frequency.

Audio Output

With standard pentode—1·5 watts; with triode—100 milli-watts. Two output impedances are provided on the receiver. Telephones or loud-speaker may be used in either jack provided their resistances are reasonably close to the values engraved on the plate. The output jacks are engraved 120 ohms and 2,000 ohms, which values refer to the D.C. resistance of the telephones likely to be used under operating conditions. The *actual* impedances are 600 ohms and 6,000 ohms respectively. (As a matter of interest the impedance of 120 ohms and 2,000 ohms telephones at 400 cycles approximates to 600 ohms and 6,000 ohms respectively.)

Crystal Filters

Where the advantages of extremely high selectivity are required the use of some form of quartz crystal filter becomes essential. There are two distinct types available, the single-peaked and the band-pass. The latter type possesses many advantages and has, therefore, been incorporated in the 358X and 400X receivers.

Two exactly similar crystals are used, but differing in frequency by the width of the band-pass required, which is 300 c.p.s. in the case of the 358X and 250 c.p.s. in the case of the 400X. The crystals are mounted in a special holder which itself is fitted inside the screening box of the first I.F. unit. A switch is provided, controlled from the front of the receiver, allowing the crystal filter to be switched in or out of circuit at will, leaving the selectivity of the receiver at the normal figure of 5 kc/s.

Since the two crystals are connected in parallel and the phasing condenser is adjusted to compensate for the total parallel capacity of crystals and holder, the

circuit will behave as two complete " crystal gates " in parallel and will give a response curve having two sharp and distinct peaks. The voltage through them will be in opposite phase, and at the output point of the circuit, their combined effect will be very low. To overcome this trouble one crystal response curve must be completely reversed in phase so that the phase in the middle region becomes addative. This is carried out quite simply by connecting the crystals in opposite arms of a bridge circuit and balancing out with the help of a phasing condenser.

The type of filter fitted, due to the improved rejection of interference outside the band, leads to an improvement in the signal-to-noise level, in fact it is quite usual to get an improvement of 20 db over the typical single-crystal filter. One other advantage is the absence of " ringing " usually associated with crystal filter circuits of the single type. This can be simply explained, since whereas the carrier in the single crystal filter is carefully adjusted to resonance with the crystal (an ideal condition to excite ringing) the carrier in the band-pass arrangement normally lies about midway in frequency between the two crystals in use.

Band-pass crystal filters provide one other great advantage, namely, the absence of phasing and selectivity controls, both of which are essential with single crystal filters. In any good design the number of controls should be kept to a minimum.

Power Unit, Type S.390

Input.—Controlled by switch. 200–250 volts 40–60 cycles.

Output.—Six volts 1·4 amperes A.C. 175/180 volts at 65 milliamperes.

Rectification.—Indirectly heated full wave valve rectifier.

Rectifier valve.—5Z4G or equivalent. Octal base (international). Condenser input circuit with two smoothing chokes reducing hum to an extremely low level, enabling headphone reception of weak signals.

The output of the unit is connected to a special five-way socket so that receivers using triode output, and having a lower anode consumption, automatically connect a 7,500 ohm bleeder resistor across the rectified high tension supply. The connection is made in the plug of the receiver itself on instruments using triode valves and omitted in those using pentodes. By this means the output voltage is maintained at a constant figure regardless of which type of receiver the unit is supplying.

Power Unit, Type S.390B

This is a replacement type unit giving the same electrical output and utilising exactly the same components as in the type S.390, the only difference being the arrangement of the components and the shape of the chassis and cover. This unit is supplied as a standard power unit for other equipment as well as the 358 and 400 type receivers.

Alternative Models

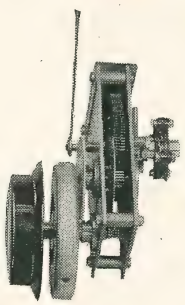
The 358/1 receiver is a modified version of the standard 358 and is intended primarily for headphone reception and, if necessary, battery operation. The normal output valve has been replaced by one drawing less anode current, and giving as a result a lower audio output. To stabilise the voltage from the power unit at the new load, a bleeder resistance of 15,000 ohms 3 watts rating is placed across the rectified output.

The " on-off " high tension switch is replaced with a similar type switch controlling the dial illumination bulb circuit.

The power unit is provided with an " on-off " switch on the opposite side to the output socket, this switch being in the mains supply circuit. It is advisable to place this in the " off " position when changing coil units.

In the case of battery operation the H.T. switch, located in the switch box unit, should be placed in a similar position, the L.T. switch being left " on " while the new coil is being inserted. A special battery lead is supplied when the receiver has to be operated from batteries. This lead incorporates a small switch box unit; a socket is fitted at the back of this unit and the lead from the receiver is inserted into same, thus bringing the two switches into circuit, and providing the necessary leads for connection to the batteries.

It is essential that both switches be placed in the " off " position when the receiver is left inoperative. Should the H.T. switch be left " on " there will be a small drain, even though the filament supply has been switched off, due to the potential divider circuit incorporated in the receiver itself.



Side view of the Special Condenser Drive Mechanism used for the Eddystone 358 and similar types of Communications Receivers.

The following power supplies are required for battery operation :—

(1) A 6-volt accumulator of sufficient capacity to give a reasonable number of operating hours, and (2) a high tension unit which may consist of four 45-volt blocks of the super-capacity type, connected in series to give 180 volts.

The type 400 and 400X receivers are based on the standard 358 design and apart from the dial calibration look the same. They have been produced for the reception of signals between 130 kc/s. and 2,200 kc/s. by means of four interchangeable coil units, and in view of the fact that C.W. reception is the main consideration the A.V.C. circuit has been omitted.

The intermediate frequency is 110 kc/s. and this, together with the design of the coil units, allows a good open dial to be utilised, giving direct calibration for the four coil units. The output valve is a triode, providing ample signal output for all normal communication use.

The 400X incorporates the same type of crystal filter unit as the 358X but has a band width of 2 kc/s. in the normal position and 250 c.p.s. in the selective position.

Aerial Arrangements

All the receivers described have provision for using either the single or doublet type aerial, whilst the usual shorting-strip connector is utilised to connect the aerial terminal to earth when using a single wire feed.

On certain models for Service use co-axial plugs are fitted to accommodate the normal type 72 ohms feeder line.

For Your Bookshelf

RADIO TECHNOLOGY. By B. F. Webber, A.M.I.E.E. Published by Chapman & Hall, 11 Henrietta Street, Covent Garden, London, W.C.2. 358 pp., 113 illustrations. Price 21s.

This book is intended to provide something intermediate between elementary and full-size standard text-books. It is practical rather than merely theoretical, at the same time the treatment is sufficiently advanced to serve as adequate preparation for the examinations of the I.E.E., Brit.I.R.E. or C. & G. Final in Radio Communications. Most of the well-known radio formulæ are proved from first principles and whenever possible simpler alternatives are provided as well as the normal mathematical methods of solution. Considerable space has been devoted to the principles of modulation, whilst there is a complete section on aerials and feeder lines. Other chapters deal with the Production of Damped R.F. Oscillations by the discharge of a condenser through Inductance and Resistance, Thermionic Valves (Diodes, Triodes, Tetrodes, Pentodes), the Valve as a Power Amplifier, Transmitters for Radio-Telegraphy, Radio-Telephonic Transmitters, Principles of Reception, and the Supersonic Heterodyne.

Frequency modulation, and V.H.F. technique are not covered but no doubt future editions will include references to these two important subjects.

The treatment given to aerial systems and feeder lines will appeal to many amateurs, and especially to those who, in past years have been a little hazy about the theory of operation of such arrangements as the " stacked " dipole. It is interesting to note that the author refers specifically to the " Windom," one of the most popular aerial systems used by radio experimenters. " Q-Bar " matching and Stub-matching systems are also dealt with at some length.

We are glad to note that Double superhets and " crystal gate " circuits are referred to, even if not quite so fully as we should have wished.

We have no hesitation in recommending this book to all who are desirous of building-up for themselves a foundation of sound radio knowledge.

* * *

THERMIONIC VALVE CIRCUITS. (Second Edition). By E. Williams, Ph.D., B.Eng., A.M.I.E.E. Published by Sir Isaac Pitman & Sons, Ltd., Parker Street, London, W.C.2. 208 pp., 127 illustrations. Price 12s. 6d.

The appearance of a second edition of this book, has, we understand, been hastened by the extensive consumption of the first edition by the Luftwaffe. New material includes an original general theorem on Valve Oscillators, and sections on Frequency Modulation, Gas-filled Valves, Time-bases, the Kipp Relay, the Transitron, the Cathode Follower, Earthing and Screening, and the Valve Voltmeter.

Those who have read the first edition need no reminding that the object of this book is to cover all the main *types* of valve circuits in such a way that the student may be in a position to understand, or even foresee, further developments. The book assumes a knowledge of A.C. theory and of mathematics up to the standard of a university student at the end of his second year. To refresh the memory of those whose university days are no more than a pleasant memory the A.C. theory used throughout the book is summarised in the first chapter. The remaining chapters are devoted to the Thermionic Valve, Amplifiers, Regeneration and Oscillation, Detectors and Rectifiers, Frequency Changers and Modulators.

The serious student will find much to interest him in the second edition of this well-known standard text-book.

* * *

PHYSICS AND RADIO. By M. Nelkon, B.Sc.(London), A.K.C. Published by Edward Arnold & Co., 41 & 43 Maddox Street, London, W.1. 388 pp., 507 illustrations. Price 8s. 6d.

This book is intended in part to be a concise elementary text-book of those principles of Physics which concern Basic Radio. It should prove of value to Radio Mechanics and Wireless Operators, and to students taking the C. and G. first examinations in Technical Electricity. It will also serve as a useful text-book for those preparing for the School Certificate examination and who desire a knowledge of Basic Radio.

There are no less than 25 chapters, each of which is profusely illustrated—a feature that will appeal especially to the younger generation of radio enthusiasts.

This is the type of book we should like to see on the bookshelf of everyone who aspires, when the war clouds lift, to operate an amateur radio station. By diligently reading its contents he or she will have nothing to fear if, at some later date, a technical examination is called for by the G.P.O. Each chapter terminates with a set of exercises which have been prepared not only with care but with a sound knowledge of the requirements of examination boards.

We predict a heavy demand for this most useful book.

J. C.

Instructor Wanted

No. 111 Squadron (Sunderland) A.T.C. is in urgent need of a Morse Instructor. Members in a position to assist are invited to communicate with F./Lt. W. E. Cockburn, Bede Towers, Ryhope Road, Sunderland. Parades are held on Wednesdays and Fridays from 7.15 p.m. onwards.

Letters to the Editor

The Loom of Language

DEAR SIR,—I have been most interested in your comments, and readers' letters, on Basic English. I have been familiar with Esperanto for some years, and next to Amateur Radio, my favourite hobby is philology, particularly with regard to auxiliary languages. English, with its wealth of literature far above that of any other natural language would be the best International language, but with its phonetic and grammatical inconsistencies has little chance of wide acceptance in our time. Basic English tenaciously retains the worst characteristics of English.

As an auxiliary, Esperanto, with all its faults, is at least consistent, and has the great advantage of already having a following, and a ready-made organisation for its propagation. " Basic " Esperanto could be learnt in a few weeks, but an even shorter time need be spent in learning sufficient " Interglossa," for Amateur requirements. The latter auxiliary (Interglossa, Pelican Books, by Lancelot Hogben) is by far the most scientific so far, and the Amateur will find that a great number of the roots are already known to him. The component parts of a sentence go together with the ease of the components of a T.R.F. receiver, and the result cannot be ambiguous.

Amateurs who are interested in the whole question of languages could do worse than read " The Loom of Language," in the same series as " Mathematics for the Million."

Yours faithfully,
VARIAN J. WILSON (ZL3DU),
R.N.Z.A.F.

* * *

Nice Work

DEAR SIR,—The appended cutting from *Western Daily Press*, dated July 5, will possibly interest your readers. Unfortunately, they did not print the individual call signs which were as follows: W1JFG; W1NCK; W2MXB; W3JJP; W5JYM; W5FSC; W6GNP; W7CQR; W8LOU; W8FRR; W8EBQ; W9HGK; W9IXM; W9JKO; and W9YJM.

Among the G's met during the past month or so were: G2HY, 4BN, 4OM, 4IK, 5GT, 5AK, 6LY, and BRS8764.

After our meeting with the American Amateurs details were sent to *Western Daily Press* bearing in mind the Editorial in the May, 1944, issue of THE BULLETIN, entitled " Public Relations."

Yours faithfully,
K. T. HARVEY (G5KT).

" Over the Air " Friends Meet

" Since the outbreak of the war very little has been heard of the British radio amateur transmitters, who, along with those of the British Empire, closed down for the duration.

The extensive use to which radio is being put in all branches of the Services has enabled the radio amateur to make his pre-war knowledge and experience a very valuable contribution to the national war effort.

When the United States of America became involved, the opportunity of personal meetings with radio amateurs from the U.S.A. was quickly appreciated by the British radio amateurs. Many old friends " over the air " have now contacted each other in the flesh for the first time, renewing and further cementing friendships formed by radio and letter several years previously.

In a West Country town a chance meeting took place between Mr. Napper (G5GT) and Sgt. K. Harvey (G5KT), of the R.A.F., and Mr. C. Fish (G4OM). The latter arranged a meeting with W1JFG, from Massachussetts, U.S.A.

Cpl. W. T. Rees (GW3CR), from Gilfach Goch, South Wales, who is stationed with Sgt. Harvey, of Bristol, met two amateur transmitters from Philadelphia and arranged a meeting with 12 others from U.S.A. They came from Texas, Colorado, Kansas, Missouri, Ohio, Wyoming, California, Maine and New York.

Sgt. Harvey brought back from that meeting an autographed QSL (verification) card with signatures of all the radio amateurs. This meeting further cemented Anglo-American relationship."

Our Honorary Editor Bereaved

Sympathies are extended to Mr. Arthur O. Milne, **G2MI**, on the loss of his father, whose death occurred suddenly on July 12 last. Mr. Milne, Senior, was known to a wide circle of Society members. He was 80 years of age and up to the time of his fatal illness had continued his many activities. He was a licensed parochial lay reader of the Diocese of Canterbury, and a diocesan reader of Rochester.

Can you help ?

Lt. R. A. S. Platt, R.N., BRS5253, 28 Wordsworth Road, Harpenden, Herts, seeks information on the theory and operation of Super-sonic Circuits. The only reference known to Lt. Platt is an American publication " Ultra-sonics," by L. Bergmann, published by John Wiley & Sons, New York.

Hospitality Offered

Mr. A. L. Cusden, **G3FB**, ex-VE5HJ, 49 Altrincham Road, Wilmslow, Cheshire, extends hospitality to visiting amateurs. Telephone Wilmslow 2082.

BRITISH ISLES NOTES AND NEWS

DISTRICT 1 (North Western)

D.R.: H. W. Stacey (G6CX), "Sandleas," Eddisbury Road, West Kirby, Cheshire. Hoylake 337.

TO remove any misunderstanding that may exist, the D.R. reminds Scribes and T.R.'s that material for District Notes must reach him in good time to enable him to prepare and type the copy for publication and to see that it reaches H.Q. by the 30th of the month preceding publication. In normal times it was possible for the D.R. to accept notes up to the 28th of the month but in present circumstances this is quite impracticable and to ensure prompt publication they must reach him by not *later than the 25th.* Reports frequently arrive on the 29th, and although every effort is made to deal with them it is often impossible to do so. As requested many times in THE BULLETIN, meetings should be held early in the month if publication of the proceedings is expected in the following month's issue.

* * *

Ashton-under-Lyne.—The July meeting of the Ashton Radio Society was held on Sunday, July 21 and was well attended. It is intended to hold a conventionette in Manchester during September. Will all interested R.S.G.B. members contact G5PX at 8, Hutton Avenue, Ashton-u-Lyne so that a date and place can be fixed and details published in the September issue. The next meeting of the Ashton-u-Lyne Radio Society will be held at A.T.C., H.Q. Astral House, Stalybridge on Sunday, August 27 at 2.30 p.m.

Bolton.—At the meeting on July 16 we were pleased to welcome Sgts. Dehn (8319) and Sutton (5686) of the R.E.M.E. Since they will be stationed in these parts for some time yet we hope to have them with us again at future meetings.

2BDA called on the T.R. recently. No sooner has he removed to Birkenhead to be near his work than his work removes itself to Manchester!

The next meeting will be at 2DVQ, 32 Bromwich Street, on August 20, 1944, at 2.30 p.m.

Liverpool.—As July and August are usually regarded as holiday months it was felt advisable to wait until September before holding another meeting. The date will be announced next month, depending upon whether or not it will be possible to hold the postponed P.D.M. in September or October. G6CX.

DISTRICT 2 (North Eastern)

D.R.: C. A. Sharp (G6KU), 56 Moore Avenue, Wibsey, Bradford. Bfd. 10772. Scribe: H. Beadle (G8UO), 13 Chandos Street, Keighley.

Doncaster.—G8IC having built an ECO converter using a 954 Acorn is now trying to get it down to 1¼ metres. 8FW is home from Egypt.

Halifax and Sowerby Bridge.—Capt. Richards, BRS6642, 3 Heath Park Avenue, Halifax, succeeds 2DUX as T.R. 2DUX who has moved to Keighley, is thanked for his good services. 8SJ has been traced to GW where he was recently on holiday.

General.—BRS5834 recently discovered that 7223 was living in his hut. 4142 reports fit and well from Normandy where he has found interest in the French domestic receivers which have continuous coverage from 13 to 2,000 metres. 2HDU from District 17 who is working in Bradford has met W9RDC. 8UO recently visited 6BX and comments on his excellent location. News of Sheffield members would be welcomed. G8UO.

DISTRICT 3 (West Midlands)

D.R.: V. M. Desmond (G5VM), "The Chestnuts," Hanley Castle, Worcester. Scribe: E. J. Wilson (2FDR), 48 Westbourne Road, Olton, Birmingham.

Birmingham.—On July 18 some 25 members of M.A.R.S. listened to a most interesting lecture by Mr. C. Naylor Strong, F.R.C.S., President of M.A.R.S., on the Electro-motive force of the nervous system. It is pleasing to find that one or two R.S.G.B. members are attending these meetings. The Annual General Meeting of M.A.R.S. will be held on September 19 at the Chamber of Commerce, New Street at 6.30 p.m.

The D.R. has received a letter from K. R. Boot who is with the Forces in the India Command—he seems to be enjoying life despite the heat of the jungle.

Rugby.—Local members are requested to contact Mr. J. Shankland, G8FM, 23 Richmond Road, Rugby, who is willing to arrange meetings. 2FDR.

DISTRICT 4 (East Midlands)

Deputy D.R.: Albert E. Clipstone (G8DZ), 14 Epperstone Road, West Bridgford, Notts.

Derby and Nottingham.—The first combined meeting held at Derby since 1939 took place at the home of G2OU on July 30. Those present included BRS4324 (Croydon), 4805 (Middlesbrough), 2FQV (Peterborough), 4071, 5514, 6053, 7328, 7967, 2CVV, G2OU, G3OZ, G5YY and G8DZ. During the meeting Mr. H. C. Murfitt gave an excellent talk on insulating materials and other plastics illustrating his remarks with a display of samples. After the meeting the Notting-Hams led by G8DZ took on more "ham" at the Gaumont Palace Cafe, thus rounding off an excellent afternoon. Local members are due to visit the receiving station of the Nottingham Rediffussion Co. at Dorket Head on August 20. Meet at Arnold Bus Terminus at 2.15 p.m. Plans are under way for a visit on September 24 to a local crystal works; this visit should be of interest to all members.

Leicester.—At the July meeting held at the home of G6VD, our host's RME 69 was on show as promised and all points under discussion were satisfactorily settled.

G4BU who paid a flying visit prior to the meeting hopes to see us again soon. 2HBG reported to be in Cumberland will find the climate a change after his long stay in Khartoum. A hearty welcome is extended to new member BRS8393, and best wishes to BRS7654, who is again serving in the R.A.F. Members will be pleased to hear that the T.R. has passed his exam.

(*via* BRS5605.)

IMPORTANT NOTICE

CLOSING DATE FOR SEPTEMBER ISSUE AUGUST 31st

REPORTS SHOULD BE POSTED TO REACH D.R.'s AND SCRIBES BY AUGUST 25th

Mansfield and Sutton.—There is no news this month but the T.R. would be pleased to hear from any local member who has any components for disposal, with a view to holding a sale.

(*via* BRS7171.) G8DZ.

DISTRICT 5 (Western)

D.R.: R. A. Bartlett (G6RB), 31 King's Drive, Bishopston, Bristol. Bristol 46960.

Bristol.—Owing to unforeseen circumstances we were obliged to cancel the July meeting. Apologies to any who turned up only to be disappointed. As many as possible were notified of the cancellation. G5KT and 5JU have recently been back for a few hours.

Swindon.—5254, who reports from Egham, is building a communications receiver in his spare time. His superior officer is 2TA. 3NC, now in the Dover area, met 5VS on top of a bus.

Cheltenham and Gloucester.—If there is still any activity in these areas, please let the D.R. have some inkling of it.

G6RB.

DISTRICT 6 (South Western)

D.R.: W. B. Sydenham, B.Sc. (G5SY), Sherrington, Cleveland Road, Torquay. Torquay 2097.

Torquay.—The D.R. has received welcome and interesting letters from G5AK, BRS4749 and 7687. He has also had visits from one or two members. He has not always been in a position to give the attention he would like to visitors, but he would ask them to realise that with so many extra duties time is very limited these days. If members would write or ring up, no doubt a meeting could be fixed up much more satisfactorily.

Taunton.—An informal meeting was held at the Y.M.C.A. on Sunday, July 16 when the following members were present: G4BN, 4OM, 5AK, 5GT, 5LM, 5KT, 6LY, GW3CR, 2DRW, plus four of our allies. It was decided to hold monthly meetings, the 2nd Sunday in one month, and the 2nd Thursday in the next.

The D.R. is very glad to hear that these meetings are being held again and wishes them every success.

Members in the Taunton area will learn with regret that G2JM has been laid up for eight weeks but is now on the mend. We all wish him a very speedy recovery. G5SY.

DISTRICT 7 (Southern)

D.R.: W. E. Russell (G5WP), "Milestones," Mayford, Woking, Surrey. Woking 1589.

Bournemouth.—The meeting on July 23 was attended by G2KU, 2NS, ex-2RZ, 3BM, 4MY and BRS6494. 2NS ran the proceedings and a P.O.W. Fund collection raised 10s. Next meeting, Saturday, August 26, 3 p.m. at 2HNO, 45 Parkwood Road. G2DP and 6CJ have been here on vacation.

Croydon.—Local meetings are being continued in spite of the "Doodle Bug." 4150, in a letter to 2DP, said that he is in Italy but that his preference lies with North Africa. He has built a

receiver to listen to the Empire transmissions. 2BB, Yately, recently visited by the T.R. has some nice gear including a 'scope and ganging oscillator. 5BT is back at business after a spell on the sick-list. (*via* G2DP.)

Coulsdon.—The T.R. was glad to see 2DBK ("Maths" Theakston) and 2HCZ at a local meeting. 2KU has once more changed his job. (*via* BRS3003).

Reading.—At the meeting held on July 29, G2YI demonstrated some of the uses to which his home constructed oscillator could be put and gave information about his neon tester. G8KJ brought along some back issues of THE BULL. for sale which resulted in a useful sum being obtained for the P.O.W. Fund. Many new faces were present at the meeting.

BRS6957 will talk on the alignment of radio receivers at the next meeting which will be held on August 26 at a new venue. (See "Forthcoming Events.") (*via* BRS4573.)

Southampton.—The meeting in July was unfortunately affected by the weather and only a small attendance recorded. The August meeting was held at the Mount Pleasant School. It is hoped that the change of venue did not cause any inconvenience. (*via* G8QW.)

G5WP.

Forthcoming Events

Aug. 20	District 4 (Leicester section), 2.30 p.m. at BRS5605, 292 Gwendolen Road, Leicester.
Aug. 20	District 4 (Nottingham section), meet 2.15 p.m. at Arnold Bus Terminus for visit to Nottingham Rediffussion Receiving Station, Dorket Head.
Aug. 26	District 7, 6.30 p.m. in The Committee Room, Palmer Hall, West Street, Reading. Talk by BRS6957, "The Alignment of Radio Receivers, Part I."
Aug. 26	District 7, 3 p.m. at 2HNO, 45 Parkwood Road, Bournemouth.
Aug. 27	Scotland "A" District, 3 p.m. in Royal Technical College, George Street, Glasgow, entrance by Montrose Street.
Sept. 3	District 14, 7 p.m. at BRS5242, 40 Stewart Grove, Chelmsford.
Sept. 3	District 7 and 13 (combined meeting) 3 p.m. at Y.M.C.A., Croydon.
Sept. 9	District 12, 3 p.m. at BRS4659, 21 Marshals Drive, St. Albans. ('Buses 304, 314, 355, 365 or 391 to Lancaster Road and turn right off main Sandridge Road at railway bridge.)

DISTRICT 10 (South Wales & Monmouthshire)

Deputy D.R.: H. H. Phillips (GW4KQ), 82 Cottrell Road, Roath Park, Cardiff. Cardiff 2697 *during business hours.*

The D.D.R. would apologise for the absence of District Notes in recent issues, but he has received no reports of interest worthy of inclusion during the past few months. A hearty welcome is extended to all new members who have joined since previous appearance of these notes.

W4BRB, whose recent brief visit to the District unfortunately did not coincide with a local meeting contacted GW3VL and 8WU. 2AGH temporarily out of the district, doubts whether he will return. 8UH now reports fit after his recent illness.

Cardiff.—The "stalwarts" attended the recent poorly supported meeting. The next will be held at the home of GW8UH, 29 Ladysmith Road, off Penylan Hill, Roath Park, Cardiff on Sunday, August 27, 1944 at 2.30 p.m. and a cordial invitation to be present is extended to all visiting and resident members.

Swansea.—No news of activities has been received.

GW4KQ.

DISTRICT 11 (North Wales)

Deputy D.R.: C. Spillane (BRS1060), "Woodside," Meliden Road, Prestatyn.

A report is to hand from Bob Dore, BERS520, now with B.W.E.F. in Normandy, reporting fit and in the thick of things. First Radio Officer Priest, BRS5520, recently toured New York in search of items for the shack, but failed to land any bargains. Ldg. Tel. Bob Jones, GW3JI is home on leave after serving for three and a half years in Syria, Aden, etc. Sigmn. Holman, 2DAH, is in the Thirsk area and is anxious to contact local members (QRA *via* BRS1060). 2FCV has left District 11 for Scotland. G2GZ reports that 2BNI is still in Newcastle but very busy. Cpl. White, R.A.F., BRS7228 is in Worcester. 2DTQ has met GW3KY, Holyhead and plans to visit GW5YB. Major Higson, GW2PH, is fit and well. All the above send 73 to their friends everywhere.

G8DZ (D.D.R. District 4) was vacationing in Rhyl recently but he failed to contact the locals, as he had to return home rather hurriedly. G2GZ is hoping to arrange a meeting in Rhyl or Prestatyn if support is forthcoming.

The writer had the pleasure of meeting G5BD and others at a District 17 meeting. BRS1060.

DISTRICT 12 (London North and Herts)

*D.R.: S. Buckingham (G5QF), 41 Brunswick Park Road, New Southgate, N.*11. *Enterprise* 3112.

North London.—Owing to prevailing conditions and holidays no meeting will be held in August. The Annual District tea party at Cuffley was enjoyed by a party of 17. The usual games sponsored by "Clarry" kept everyone going. We extend our thanks to Mrs. Violet Mathews, wife of G6LL, for having us and also for providing tea, complete with pre-war standard "sossage" rolls!

St. Albans.—The next meeting will be held on a Saturday when it is hoped there will be a good attendance. Service visitors can be sure of a warm welcome. (See "Forthcoming Events" for details.) The T.R. has been pleased to receive a visit from Associate member R. Lindridge. G5QF.

DISTRICT 13 (London South)

A.R. (South Eastern and Central), S. E. Langley (G3ST).

South Eastern and Central Areas.—Owing to the uncertainty of things in general there was only a very small attendance at the July meeting at the Y.M.C.A., Croydon. Those present were G2JK, 2UA, BRS3003, 5317, 6733 and 8031. We were also pleased to welcome 6733 and 8031, who had come from some distance to attend and were sorry that the main part of the meeting had to be called off. G3ST regrets having to move hurriedly to a new QRA. He has several valve bases for disposal! 2HHD, 4324 and several others, complain of draughty shacks, otherwise all is O.K. on the Home Front. To our friends in the Front Line, best of luck, and please push one over for us next time. See Forthcoming Events for next meeting.

G3ST.

DISTRICT 14 (Eastern)

Scribe: L. J. Fuller (G6LB), 167 Galleywood Road, Chelmsford, Essex. Telephone: Chelmsford 3929.

There is practically no news from District 14, as Home Guard duties and Civil Defence work leave little time for Radio. Meetings are still held at Chingford and Chelmsford with fair regularity, and occasionally at Romford.

The last Chelmsford meeting was in July, when members inspected the Scribe's latest "toy"—an Eddystone E.C.R.

For details of the next Chelmsford Meeting, see "Forthcoming Events." G6LB.

DISTRICT 15 (London West, Middlesex and Buckinghamshire)

D.R.: H. V. Wilkins (G6WN), 539 Oldfield Lane, Sudbury Hill, Greenford, Middlesex. Byron 3369.

The only news comes this month from G5JL now promoted to A.Q.M.S. while serving in Italy. Not being able to be present at the Dinner he intended to have a drink with us on that date. We hope he enjoyed it. Both he and Mrs. Maling are to be congratulated—we did not know they had a daughter. BRS7235 has recently met another BRS member in the forces while 2KI writes again from South Wales, reporting well. He has heard from 2LA and 2NN. 3UQ is fit and well and sends greetings to all his old friends. G6WN.

DISTRICT 17 (Mid East)

D.R.: A. C. Simons (G5BD), Admiralty Road, Mablethorpe. Phone 69.

Eight enthusiasts attended a meeting in Louth on July 22, and three hours of rag-chewing passed all too quickly. Present included G3VP, 7456 (District 2), 1060 (District 11), G5BD, G4GX, G2VY and G3OS, the latter doing a round trip of 70 miles on a cycle. G4BY (District 16) who mistook the date and attended a "one ham" meeting the previous week, was unable to get along, but he hopes to contact the D.R. shortly. 2BYS has offered to act as T.R. for Grimsby and G3OS for Gainsboro'. G2UK has been in Normandy since the start of the invasion; 4390 is sorry his leave and meeting did not coincide; G6LI now with two stripes could have joined us a day later; G5LL must have positive bias as he is now in Naples. A meeting will be held in Grimsby during September, announcement next month. The sum of 15s. was collected for the P.O.W. Fund. G5BD.

DISTRICT 18 (East Yorkshire)

District Scribe: S. Davidson (G6SO), 10 Sidney Street, Scarborough.

Hull.—G3PL who reports contacts with 6OS, 8UL, 5120 and 6185, has written a short article for THE BULLETIN on the subject of a two valve B.C.L. receiver using 9 volts H.T. He has persuaded a local dealer to display the R.S.G.B. poster. A welcome awaits any member on Monday evenings after 7 p.m. at 3PL's QRA: 79 Hayton Grove. 7618, recently married, paid a flying visit to the district with his wife who is a B.B.C. engineer. 2QO is believed to be about to leave the town for abroad. The possibility of starting local meetings again is under discussion. (*via* G3PL.)

(*Continued on page* 32)

HEADQUARTERS CALLING

COUNCIL 1944

President:
ERNEST LETT GARDINER, B.Sc., G6GR.

Executive Vice-President: S. K. Lewer, B.Sc., G6LJ.
Honorary Secretary: H. A. M. Clark, B.Sc., G6OT.
Honorary Treasurer: A. J. H. Watson, A.S.A.A., G2YD.
Honorary Editor: Arthur O. Milne, G2MI.
Immediate Past President: A. D. Gay, G6NF.

* *

Members: F. Charman, G6CJ, D. N. Corfield, D.L.C.(Hons.), G5CD, Group Capt. G. R. Scott Farnie, GW5FI, F. Hoare, G2DP, Wing-Com. J. Hunter, G2ZQ, W. E. Russell, G5WP, H. W. Stacey, G6CX.

General Secretary: John Clarricoats, G6CL.

June Council Meeting

*Resume of the Minutes of a Meeting of the Council of the Inc. Radio Society of Great Britain, held at New Ruskin House, Little Russell Street, London, W.C.*1, *on Monday, June* 26, 1944, *at* 6 *p.m.*

Present.—Messrs. E. L. Gardiner (President), S. K. Lewer, A. J. H. Watson, A. D. Gay, A. O. Milne, D. N. Corfield, G. R. Scott Farnie, F. G. Hoare, W. E. Russell and J. Clarricoats (General Secretary).

Apologies.—Messrs. A. E. Watts, F. Charman and H. W. Stacey.

1. It was unanimously resolved to elect 186 Corporate Members (145 proposed by Corporate Members, 41 supported by references), 12 Associates, 13 Junior Associates and one Life Member, Mr. Bryan Groom, GM6RG, The Hollies, Galashiels.

2. The Monthly Balance Sheet and Statement of Account was presented and adopted.

3. It was agreed to renew the General Secretary's Service Agreement, with modifications, as from October 1, 1944.

4. It was agreed to order 500 copies of the Kilocycles to Metres Conversion booklet with paper covers. The selling price was fixed at 1s. 3d. per copy.

5. It was reported that owing to the creation of a Far East Prisoners of War Reserve Fund, the balance in hand for the European Fund had fallen to £249. In view of this it was agreed that as from July, 1944, the value of parcels to be sent to Prisoners of War in Germany should be reduced from £2 to £1 per month.

6. It was reported that Dr. R. L. Smith-Rose (Hon. Member) had been entertained by the A.R.R.L. during his recent visit to America.

7. A copy of a report entitled " Post-War Development in Radio Engineering, Part I " prepared by the Brit. I.R.E. was tabled. As no reference is made in the report to radio amateurs the President agreed to call the attention of the Brit. I.R.E. to the omission.

8. A member put forward numerous suggestions aimed at raising the status of the Society by introducing new grades of membership. It was agreed to file the letter until such time as the Council decides to give consideration to changes to the Articles of Association.

9. A draft summary of Council's policy in regard to licence matters was considered. After discussion it was agreed that the President should prepare a schedule of headings for presentation to Council.

10. Consideration was given to a draft memo. outlining the activities of the Society for presentation to the W./T. Board.

11. In connection with the development of plans for the post-war amateur market, it was agreed to prepare a comprehensive list of suggestions received from members of Council with a view to presenting them to the trade at a later date.

12. *McMichael Radio, Limited* wrote offering to support the Council in its efforts to provide new items of equipment for British amateurs after the war. The offer of co-operation was accepted with thanks.

13. As only seven members had written to express their preference for Friday evening or Saturday afternoon meetings at the I.E.E., it was agreed to defer a decision until a later Council meeting.

14. It was reported that 32 copies of THE BULLETIN were distributed free of charge each month to Libraries, Scientific bodies, Services personnel, Periodicals, etc. The list was approved. It was agreed to add the Newfoundland Amateur Radio Association to the free list.

15. It was reported that successful District Meetings had been held in Croydon and Park Royal. It was agreed that a small deficit which had occurred in connection with the Croydon meeting should be debited to the District Meetings Reserve Fund.

The meeting closed at 8.50 p.m.

Important Notice

Owing to prevailing conditions in Southern England all copy for inclusion in the September issue must reach Headquarters not later than *Thursday, August* 31. T.R.'s and others contributing reports should post them in time to reach their D.R. or Scribe by August 25. Copy received at Headquarters after August 31 will not be accepted for the September issue.

Bankers Orders

Members who make use of the Bankers Order arrangement for paying their annual subscription are reminded that the actual order should be sent direct to Headquarters after completion, and not to a bank. Considerable inconvenience has been caused through deviation from the correct procedure, which is carefully explained in the Subscription Account notice issued by the Society.

Subscription Rates

Service members are again reminded that the reduced subscription of 10/– per annum, is intended to apply only to those whose financial position has been adversely affected as the result of joining H.M. Forces. The arrangement was made in the early days of the war to assist pre-war members who had been called to serve at a low rate of pay. It was not visualised by the Council that members who had reached high rank would continue to take advantage of the reduced subscription rate, neither was it anticipated that members who used the Bankers Order scheme whilst serving in the ranks, four or five years ago, would continue to pay at the reduced rate after receiving promotion.

It is hoped that all Service members will revert to the 15/– subscription rate automatically unless circumstances prevent them from doing so.

Returned Bulletins

Every month many copies of THE BULLETIN are returned to Headquarters because the address to which they have been despatched no longer holds good. This applies in particular to copies redirected to Service members from their permanent address.

We reiterate that immediately a BULLETIN is returned the appropriate stencil plate is removed from file until such time as the member concerned communicates with Headquarters.

Lost BULLETINS cannot under any circumstances be replaced at the present time.

Headquarters Address

A considerable amount of official Society correspondence is still being delivered to the General Secretary's private address. This, in spite of frequent requests for all R.S.G.B. correspondence to be sent to New Ruskin House, 28/30 Little Russell Street, London, W.C.1.

Those who act as sponsors to applicants for membership are kindly requested to record the above address on the application form, if the latter bears the temporary war-time address of the Society, *viz.* 16 Ashridge Gardens, Palmers Green, London, N.13.

When communicating with Headquarters the Society's name must *always* preface the address. Embarrassment and delays are often caused because letters intended for the Society are opened by one of the other firms operating from New Ruskin House.

Changes of Address

Members who change their permanent address are asked to note that at least one month must elapse before the change can become effective for BULLETIN despatch purposes.

The Society cannot, under existing conditions, send the BULLETIN direct to a Service address. Members on Active Service should arrange for re-direction from their home address. Provided re-direction is effected promptly, no additional postage is required.

Technical Publications

The attention of members is directed to the fact that no facilities exist at Headquarters for obtaining technical publications other than the American publications listed below. Considerable inconvenience is caused by members who send cheques and postal orders for other publishers' books when forwarding either their subscription or an order for American publications.

American Publications

The Society is in a position to accept orders for the following publications which are ordered individually from America :

" QST " (Official monthly publication of The American Radio Relay League). By subscription, per annum	17s. 6d.
" The Radio Amateur's Handbook " (A.R.R.L.) ..	10s. 6d.
" The Radio Amateur's Handbook "—Special Defence Edition (A.R.R.L.)	8s. 6d.
" The Antenna Handbook " (A.R.R.L.)	4s. 0d.
" A Course in Radio Fundamentals " (A.R.R.L.) ..	3s. 6d.
" The Radio Handbook " (Editors and Engineers Los Angeles)	12s. 0d.

Orders must be accompanied by a remittance made payable to the Society and rates and prices are subject to alteration without previous notice. Delivery can be expected in about 12 weeks from date of order. Service Addresses must not be used. Single copies of text books only may be ordered.

Reprinting Again

THE AMATEUR RADIO HANDBOOK and RADIO HANDBOOK SUPPLEMENT are again being reprinted. Orders for single copies of previous printings can still be accepted at Headquarters.

The Teaching of Mathematics to Physicists

The Mathematical Association and the Institute of Physics have recently issued a report entitled "The Teaching of Mathematics to Physicists." Copies are available free of charge upon application to the Institute of Physics, The University, Reading, Berks.

Situations Vacant

Vacancies exist in a well-known, and old-established, London firm of book-publishers for young women of good educational standard. Applicants should be under 18 years of age and resident in the London area. Vacancies also exist in the same firm for adult book-keepers, preferably elderly men with past experience.

The General Secretary will be pleased to hear from any member who is in a position to make a recommendation.

Subscriptions to "Radio"

Until further notice no further subscriptions to the American monthly publication *Radio* can be accepted by the Society.

KILOCYCLES TO METRES
CONVERSION TABLES
AGAIN IN STOCK
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R.S.G.B. Prisoners of War Fund

DONATIONS.—The General Secretary acknowledges with thanks, on behalf of Council, receipt of donations from :—H. E. Sutton, 2ANS, 21s.; D. J. George, G2UA, 2s. 6d.; District 4, per G8DZ, £1 18s.; D. M. Innes, BRS96, 5s.; W. G. Hopcroft, GM4AN, £5; K. A. Ebbs, BRS5157, 21s.; H. Binns, 4s.; G. C. Eyre, 1s.; A. G. Archer, G8NU, 5s.; Anon, 3s. 2d.; C. E. Jefferies, 5s.; C. W. Hare, 20s.; H. E. Hulbert, BRS6646, 10s.; K. A. Bennett, 5s.; T. R. Brooke, 5s.; District 13, 7s. 6d.; A. V. Grant, BRS6886, 15s.; No. 1 Sigs. Depot, R.A.F., £4 5s.; Anon, £2 5s.; District 17 (Louth Meeting), 15s. **Total receipts to date, £1,321 17s. 6d. Expenditure to date, £802 16s. 6d. Balance in hand as at July 28th, 1944. European Fund £209 1s. 0d. Far East Fund £310 0s. 0d.**

News from the Kreigies

● Letters are to hand from several members held captive in Germany, all of whom express their thanks for the parcels received from the R.S.G.B. P.O.W. Fund. Walter Caughey hopes to meet many of his friends at an early date.

Congrats.

● To Ft./Sgt. R. F. Blair, **BRS4979**, of Morpeth, who we learn has been awarded the B.E.M. (Military Division). He is at present serving with the R.A.F. in Canada.

● To Cfn. G. M. Stitcher, **BRS5220**, of Highams Park, London, whose wife presented him with a daughter, Carole Linda, on June 10.

● To Sgt. C. F. Ward, R.E.M.E., **2CVV**, whose marriage to Miss Joan Cauldwell took place last month in Derby.

● To L.A.C. D. Barlow, **2HBG**, who was married on June 17, shortly after returning from a long spell of duty in the M.E. He is now at an R.A.F. station in Cumberland.

● To Sig. B. Healey, **BRS4216**, one of the original "Batchelors" whose wife has presented him with a son and heir.

● To Sgt. J. J. Williamson, R.A.F., **BRS5229**, of Sleaford, Lincs, now proud father of a son, Paul Richard, born June 26, 1944.

● To Sgt. L. S. Wright, **BRS4700** now at No. 4R.S. whose marriage takes place on August 16 to Miss Joan Royle, W.A.A.F.

● To Arm't Staff Sergeant T. R. Brooke, **BRS4315**, of 19 Westgate, Sleaford, Lincs, who was married on April 15 last to Miss A. Garvie, of Dundee. BRS4315 would like to contact G6TV and 8QR.

● To Mr. and Mrs. P. Harrad, **G8UN**, on the birth of a daughter —Christine—on July 15, 1944.

Watt A Loss !

Ham: "I saw a Spitfire shoot down two doodle-bugs this morning."

Spam: "Good. That reduces V-1 by another 2 db."

G6LJ.

KHAKI and BLUE

● By Airgraph from the C.M.F., F./O. Frank Wyer, **G8RY**, reports meeting G6FK and G3NX. He is anxious to contact G3AG and sends 73 to G3UP, 8FY and 2FSO.

● Eric Trebilcock, **BERS195**, in an Airgraph to G2MI sends the news that Lt. G. Whittaker, VK9GW, has been awarded the M.B.E. and W./O. V. Gilchrist, VK9XG, the M.M. Both decorations were won in New Guinea. Friends of BERS195 may like to note that he has now moved to 53 Lambert Road, Joslin, South Australia. He is attached to an Allied station "not so distant" from Adelaide.

● District 12 members will be interested to hear that Cpl. Stan Geary, **G3MO**, recently met War Correspondent Reg Pidsley, **G6PI**, in North Africa. "You can never imagine," writes Stan, "how much that meeting meant to me, it seemed that for six or seven hours the war was forgotten. I was once more a human being, with all the enthusiasm for the old game." G3MO had the privilege of working under F./Lt. H. Barnett, 2AIQ, of Potters Bar, for some time but they did not have a great deal of time to get acquainted before becoming separated.

● Sgt. G. A. Lambourne, **2DQI**, an original member of the R.A.F. fitting parties is still on similar work in the Eastern Mediterranean. He mentions meeting G2PA recently in the Cairo area, and states that 2LF is, or was, in hospital out East. Whilst in Kenya and Madagascar, Sgt. Lambourne met VQ4KTB, 2AUM and 2FRS. He says that the R.S.G.B. Handbook is well in evidence everywhere, but the Supplement is not so well known.

● Writing from the N.W. Frontier of India, Cpl. Cliff Sharratt, R.Sigs, **G4CJ**, reports fit and well. Whilst at Mhow earlier in the year he met G3OO who was in the process of obtaining his commission. At his present station, which is in the hills, he finds atmospherics something to think about. "Frequency modulation seems the only solution. The noise made by charged dust storms has to be heard to be believed." He recently made up the code-practice set described in the February Bulletin by 2BAB and obtained excellent results. A loud speaker hung in front of the microphone proved very successful. With a 12-volts accumulator a deafening howl was obtained—6-volts proved just right.

● From C. E. Brookes, **BRS3811**, we learn that Joe Rockall, G2ZV, is now a Sq./Ldr., and Stan Conway, VS6AQ, a Wing-Commander. BRS3811 has recently been "elevated to the peerage" and is now a P./O.

● L.A.C. F. Monk, **BRS4297**, in an A.G. from India to G2MI, asks that his greetings be conveyed to G6VR and 8GG. He has lost contact with both and hopes to hear from them *via* his home address. Of THE BULLETIN he writes: "I wish you could see how it gets around. I send it on to G5ZN after we've finished with it and then it disappears for about nine weeks."

● From Normandy comes news of Capt. Arthur Gee, R.A.M.C., **G2UK**—Chief "Privy" Counsellor ! We gather that the sanitary arrangements for future District 17 N.F.D.'s will be "the last word." He writes cheerily and sends greetings to all old friends.

● P.O. Radio Mech. Jack Brazzill, **G3WP**, in a letter from Iceland reports that his efforts so far to locate BRS2977 and 5796 have proved unsuccessful, although he is hopeful of tracing the latter before long. Jack would appreciate letters from G5VS and 2BUV and sends greetings to G6AB, 8AX and all old friends. His home address for all communications is 41 Queen Street, Brightlingsea, Colchester, Essex.

● Pte. D. M. Henderson, **BRS4504**, in a further report from India, states that the Meerut radio club working in conjunction with the local Toc H, have recently been asked by the O.C. British Military Hospital, Meerut, to service and maintain the several radio sets in use in the hospital. This is the chance Pte. Henderson and his colleagues have been waiting for, as it will enable them to obtain actual servicing practice which is otherwise impossible due to the exorbitant prices of radio material in India. BRS4504 has been in touch with J. N. Carter, R. Sigs., BRS6174 and W. Moorwood, R.A.F., BRS6446.

Silent Keys

The death of Jimmie Ferguson, **GM6WD**, removes from the ranks of Scottish "A" District members a most enthusiastic amateur. His station was widely known especially in U.S.A. on 14 Mc/s. telephony and his loss will be felt by many members of the Society. Sincere sympathy is expressed to his widow and family. J.H.

* * *

It is with sorrow that we record the death at the early age of 30 years of Mr. Colin Alexander Mackay, **2BMZ**. Mr. Mackay, who contributed an article on the Magic Eye Voltmeter to the last issue of this Journal, joined the Society in 1931 and remained in membership throughout that period, except for a short break. His death took place on May 21, 1944, in Leys School Hospital, Cambridge, after a brief illness.

We extend our sympathies to his widow and other relatives.

J.C.

SERVICING COMMUNICATIONS RECEIVERS—

(*continued from page* 23)

1,400 kc/s. and trim the aerial and R.F. circuits to resonance. The whole procedure is repeated on each waveband, choosing a suitable frequency at each end of the band under test. A word of warning must be noted here. As the frequency range is increased the second channel signal will become more prominent and great care must be taken to see that the receiver is being adjusted to the correct frequency. As the second channel signal is twice the intermediate frequency away from the correct point a 15,000 kc/s. input from the generator will produce two signals on the receiver—the true one on 15,000 kc/s. and its image on 14,070 kc/s., assuming an intermediate frequency of 465 kc/s. Thus it is important always to trim the receiver to the higher-frequency signal.

Due to the fact that most signal generators give a strong harmonic output it is possible to set the apparatus to one or two spot frequencies and use the harmonics from these to align the receiver. In the case of the wave-ranges covering the 1·7 Mc/s. and 3·5 Mc/s. amateur bands it is possible to set the generator at 1,000 kc/s. and use the harmonics on 2,000, 3,000, 4,000, 5,000 kc/s., etc., for both trimmer and padder adjustments. Similarly a 5,000 kc/s. output will give harmonics strong enough to provide a signal in the 28 Mc/s. band. In some makes of receivers the adjustment for the L.F. end of the band takes the form of a brass plunger or disc associated with the coil, but the procedure is similar to that of the more usual variable capacity. The system of brass plungers is found on the Hammarlund receivers, while certain Hallicrafter models such as the SX-16 and SX-17 have preset condensers switched in series with the main gang condenser for accurately aligning the aerial and R.F. circuits at the low frequency ends of the bands.

DISTRICT NOTES—

(*continued from page* 29)

DISTRICT 19 (Northern)

D.R.: R. J. Bradley (G2FO), 36 Raby Road, Stockton-on-Tees.

2HMK of Darlington, is building audio equipment and learning Morse Code. He is handicapped by not having a practice partner and would be prepared to share his "Candler Code System" with anybody willing to help.

3ZY of Morpeth reports that he has been in the Middle East for four years, during which period he has been completely out of touch with amateur radio. He sends 73 to all District 19 members and thirsts for news from the "Geordie-landfront." The D.R. recently received a letter from VE5EC saying that he is now stationed in the District. G2FO.

Scotland

Scottish Records Officer: J. Hunter (GM6ZV), 51 Camphill Avenue, Glasgow, S.1. Langside 237.

"A" District.—No meeting was held during July due to the local holidays, but regular meetings will resume on August 27, usual place and time. Members will note with sorrow that Jimmie Ferguson, GM6WD, died on July 4 after a long illness and we express our sincere sympathy to his widow and family. During the month GM6ZV had a visit from BRS4474. GM3AR has completed a valve voltmeter. GM6ZV.

Northern Ireland

D.R.: J. N. Smith (GI5QX), 19 Hawthornden Drive, Belmont, Belfast. Telephone: Belfast 63323.

Belfast.—It is remarkable how this Province manages to remain so silent and one wonders if this will still persist when peace comes along and the licence question comes up for review!

This month we have pleasure in extending a cordial welcome to our second lady member, Miss Peggy Holden, BRS8388. Peggy, who is serving with the R.A.F. signals as a W./Op. "somewhere in Gi," is the daughter of GI5HU, T.R. for Belfast.

GI5UW reports meeting G. H. Galarza, W5JMJ, of Texas. Ken Winsor, G2FS, of Hull, recently paid visits to GI6YM and GI5HU. F./O. F. A. Robb, GI6TK, whilst at Camp with the A.T.C. met G2XC, G2BZ and W9IEX, he also reports meeting G2FS and 2DHB (T.R.) in Derry. G4RX and W2IOP have visited the D.R.

It having been suggested that a P.D.M. be held in Belfast in September or October the Society's representatives in GI would be pleased to hear from those who would be prepared to lend this venture their support. A p.c. will do. GI5QX.

EXCHANGE & MART—ADVERTISEMENT RATES

ALL KINDS OF PRINT.—Send your enquiries to G6MN, Castlemount, Worksop.

AMATEUR has for disposal some spare gear. Many usefu articles and some tubes including Acorn.—S.A.E. for list to GRAVES, "Hillcrest," Chalvington Road, Chandlers Ford, Eastleigh, Hants.

BUG KEY for sale to best offer.—Send S.A.E. to BENNISON, The Haven, Derbyhaven, Isle of Man.

DB20 wanted. Must be in good working order. Write stating age, use and price required.—JOHNSON, Pinchbeck Hall, Spalding, Lincs.

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FOR SALE.—Chassis, transformers—mains and L.F., L.F. chokes, S.W. variable condensers, coils, etc. S.A.E. for list.—BM/STR, London, W.C.1.

FOR SALE.—D.C. Avominor in good condition. First reasonable offer secures.—GILLIES, 3 Berridale Avenue, Glasgow, S.4.

FOR SALE.—Ham (Midlands) has for disposal good quality components, receivers, amplifier, mike stand, etc. Offers S.A.E.—Box 406, PARRS, 121 Kingsway, London, W.C.2.

FOR SALE.—Kit of components, new. 5 metre including "Keston" choke and microphone transformer. Radio technical books, new; also *Televisions* and American *Radio-Crafts*. Stamp for list.—BRS4437, 11 Edward Street, May Bank, Newcastle, Staffs.

FOR SALE.—One copy Riders' *A. C. Calculation Charts*, 35s. One Taylor Model 425, 0–50 micro-ammeter, £8. Both items brand new.—FOX, 39 Minmouth Road, Hayes, Middx.

MAZDA 7-inch cathode ray tube with all coils and high voltage transformer. Offers.—MORRIS, 34 Birch Avenue, Romiley, Cheshire.

MONOMARK service.—Permanent London address. Letters redirected. Confidential. 5s. p.a. Royal patronage. Key tag 9d.—Write BM/MONO7A, W.C.1.

Q.S.T.—43 copies November, 1934, to August, 1938. Offers.—2HLF, 9 Theobalds Green, Heathfield, Sussex.

SALE.—Four Ferranti 3-range flush mounting 2½ in. meters. 0–7½–30–150mA, 0–30mA 0–7½–150v, 0–7½–15–30mA, 0–10–50–250v. What offers?—WHARMBY, 38 Wickentree Lane, Failsworth, Manchester.

SPECIAL Turner (U.S.A.) voice frequency communication model crystal microphone, absolutely as new, £6 10s. 0d. Brand new Woden power transformer, 1650–0–1650v, 450mA, £12 10s. 0d., beautiful job; also all components for 1,500v 400mA pack. Much other fine apparatus. S.A.E. details.—Box 392, PARRS, 121 Kingsway, London, W.C.2.

THE BULLETIN, complete from June, 1926, to December, 1939. What offers?—G5FJ, JACKSON, "Ringles," Headcorn, Kent.

URGENTLY wanted.—July, August and November, 1943, copies of BULLETIN.—D. HUPPLER, 4 Berkshire Road, Henley-on-Thames.

VALVES.—955, 25s. 6Q7G, 6K7G, 6K8G, 655, 76, D210SW, X65, 7s. 6d. each. Ten octal valve-holders, 5s. 6d. Transformer AF3C, £1. Westinghouse 1mA type meter rectifier, £1. Smoothing condensers 4 + 4 + 4 μF 250v working, 10s. 6d.—Box 394, PARRS, 121 Kingsway, London, W.C.2.

WANTED.—A.C./D.C. communications receiver in good order. —Details, price, etc., to Box 400, PARRS, 121 Kingsway, W.C.2.

WANTED.—1A7GT, 1H5GT, 1N5GT, 1Q5GT or 1T5GT, and any other midget components.—Offers, prices to BRS6636, 5 Albion Street, Aylesbury, Bucks.

WANTED.—Two-valve short-wave set in perfect working order. State bands covered, whether mains or battery operated, price and make.—ARMSTRONG, Westburton, Bamburgh, Northumberland.

WANTED.—Vibroplex or similar key. State price.—LDG. TEL. F. W. FISHER, G3VM, "H.M.S. Clarkia," c/o G.P.O., London.

WANTED.—*Wireless World*. July 21, 1933; *QST*, August, 1931, October, 1933; *Radio*, February, March, 1937, September, October, November, 1939.—SIMMONS, G3AD, Croft Farm, Charleton, Kingsbridge, Devon.

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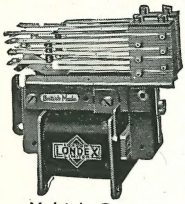

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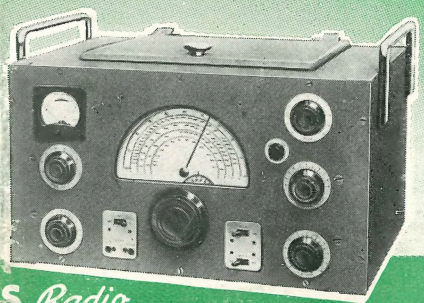

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